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SECURITY INFORMATION

Office Memorandum • UNITED STATES GOVERNMENT

TO : Acting Chief, Engineering Branch, Commo DATE: 8 November 1951 50X1
ATTN : [redacted]
FROM : Chief, Procurement & Contract Division

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JUST 22 NEXT REV 2010 AUTH: HR [illegible]

SUBJECT: Requisition 51-7165-A for Navy Type DAQ

1. Reference is made to conference of 29 October 1951 concerning the modification of the three Navy Type DAQ receivers now in stock into Navy type direction finders. Following this meeting, [redacted] of this office visited 50X1
the office of Lt. R. B. Bodenhammer, Navy Department, who had previously been contacted by your [redacted] Lt. Bodenhammer has been succeeded by 50X1
Lt. Comdr. Kane. Subsequent to this, your memorandum dated 1 November 1951 was received.

2. It was found that the unsatisfactory conditions referred to in paragraph 2 of your memorandum of 1 November have changed in the meantime.

a. The funds in the original amount of $5,000.00 have been increased to $38,000.00 under Contract NObsr 52724; it may be necessary to add still more funds.

b. Navy has supplied specifications "Ships A-464 dated 1 May 1951" to the Contractor to cover the work required.

c. Apparently the Contractor has all the required items from Navy since Navy advises that they have been promised delivery in December 1951 and January 1952.

3. a. Attention is invited to Requisition 51-7165-A which merely lists "Direction Finding Equipment, Sig. C, Type SCR 502 or Navy Type DAQ (fitted with Adcock Antenna)". No specification of any kind is cited. Also the memorandum of 1 November 1951 merely states "three DAQ units for plan [redacted] be modified for 50X1
use with Adcock antennas." No specification of any kind is cited. It is felt, in the interest of being certain that the equipment is modified in accordance with your exact technical requirements, that specifications should be furnished by your office for the work to be done.

b. In this connection, there is forwarded herewith for your information Navy Specifications for "Antenna, Direction Finder, Radio, Shore, Transportable", Number Ships A-464, dated 1 May 1951; please return these specifications to this office. Please note that under paragraph 1.2 of the specifications there is an option for Type I - Low Frequency Array or Type II - High Frequency Array "as specified in the contract." This requires a stipulation as to whether either or both of these array's are desired.

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Please advise this office if you wish procurement to be made in accordance with the specifications referred to above, or furnish other pertinent specifications so that appropriate action may be initiated.

4. Attention is invited to the fact that your requisition and memorandum do not include any requirement for spare parts, instruction books, or installation drawings. It may be that these items are not desired by you, but these items are brought to your attention since they are usually required in equipment of this type. If so, please furnish an itemized parts list and any other requirements.

5. The Navy has raised a question which is technical in nature, and therefore is submitted for your review and advice. Paragraph 3.2 of the Navy specifications states "One DAQ receiver and indicator shall be associated with each array." The accompanying Navy Drawing, Fig. 1, shows a low frequency array and a high frequency array. This would indicate two arrays and by reference to that part of the specification quoted above, would appear to require two DAQ's for each set if the high frequency and the low frequency are to be swept simultaneously. If this is correct, then a total of six DAQ's are required to make the three sets requisitioned by you. However, only three DAQ's are in the Agency's stock and inquiry by this office to the Navy indicates that no more DAQ's are available from Navy sources. Obviously, if the informal information received from Navy is correct, there are not enough DAQ's available for three sets of direction finders simultaneously covering the high and low frequencies. Please advise this office when stating your specifications as to this matter.

6. It is noted that in Navy Contract NObsr 52724 that the Navy has agreed to furnish the Contractor with:

"RG-24/V cable as required; Four (4) 52300 - Target Transmitter"

Is it the plan of your office to furnish any Government supplied materials to the Contractor? If so, such items should be requisitioned and specified, with instructions that they are to be used as Government Furnished Materials.

50X1

Incl: Navy Spec A-464

Serial No. 21

SHIPS-A-464
1 May 1951

BUREAU OF SHIPS CONTRACT SPECIFICATION

ANTENNA, DIRECTION FINDER, RADIO, SHORE, TRANSPORTABLE

This specification is for use only with Bureau of Ships Contract Work Order No. 800-19819.

1. SCOPE

1.1 Scope. - This specification covers the design and construction of transportable high frequency shore radio direction finder antenna arrays for use with Model DAQ direction finding receiving and indicating equipment.

1.2 Classification. - Equipment covered by this specification shall be of the following types, as specified in the contract or order:

Type I - Low-Frequency Array.
Type II - High-Frequency Array.

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications and publications, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

TT-P-81 - Paint, Ready-Mixed, Olive-Drab.

MILITARY

JAN-P-658 - Packaging and Packing of Electrical Equipment and Spare Parts (Electronic, Electrical, and Electro-Mechanical).

MIL-T-945 - Test-Equipment, for Use With Electronic Equipment; General Specification.

MIL-E-2036 - Enclosures (for Nonrotating Electrical Equipment) (Naval Shipboard Use).

NAVY DEPARTMENT

General Specifications for Inspection of Material.

16E4 - Electronic Equipment, Naval Ship and Shore; General Specification.

16E6 - Electronic Spare Parts Requirements; Instructions for Determining.

16E7 - Electronic-Equipment, Selection and Application of Parts for.

BUREAU OF SHIPS RADIO

16B16(RE) - Books, Instruction (for Ship or Shore Electronic Equipment).

RE13A516 - Nameplates, Marking and Assignment of Navy Designations to Radio, Radar, and Underwater Sound Equipment.

PUBLICATIONS

MILITARY

Armed Services Index of R. F. Transmission Lines and Fittings.

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General requirements. - The direction finder antennas, types I and II, shall constitute an antenna system efficiently and compactly designed. The equipments constructed shall be suitable for continuous operation with a minimum of maintenance under actual service conditions and shall meet the applicable requirements of Specification 16E4, except as otherwise specified herein.

3.1.1 Instruction books. - Supplements to the Model DAQ instruction books (see 6.1) shall be supplied in accordance with Specification 16B16(RE).

3.1.2 Spare parts. - Spare parts shall be supplied in accordance with Specification 16E6.

3.1.3 Nameplates. - Nameplates bearing markings and assigned designations shall be in accordance with Specification RE13A516.

3.1.4 Temperature and humidity. - The equipment supplied shall be capable of continuous and/or intermittent operation under the temperature and humidity conditions specified in Specification 16E4 except that a -40° to +50° C. temperature range shall apply.

3.1.5 Cabling. - The equipment shall be so designed that R. F. cables and fittings listed in the Armed Services Index of R. F. Transmission Lines and Fittings may be used.

3.1.6 Fungus-inert materials. - Materials which are non-nutrients for fungi and insects shall be used. No additional fungus-proofing shall be employed.

3.2 Description. - The antenna arrays and associated features shall be similar to those incorporated in the Signal Corps Direction Finder Radio Set SCR-502 (see 6.1). The antenna equipment shall consist of an antenna array composed of a pair of crossed U-Adcock antennas with a sense monopole. The monopole components of each U-Adcock shall be located at diagonally opposite corners of a square with the sense monopole located at the center. Counterpoise screens shall be provided. Coupling networks located at the bases of each monopole shall be provided to couple the monopoles to balanced interconnecting cables. Suitable cases, crates, and/or reels shall be provided for transporting the arrays and DAQ receiving and indicating equipment. One DAQ receiver and indicator shall be associated with each array. Each receiver, indicator, and associated array shall be capable of independent operation.

3.2.1 Monopole antenna masts. - The monopole antennas shall be tubular self-supporting masts, mounted on tripods.

3.2.1.1 The masts shall have overall lengths when erected as follows;

Type I, low-frequency array - 28 feet.
Type II, high-frequency array - 17 feet.

3.2.1.2 The masts shall be designed to have a maximum collapsed length of 14.5 feet.

3.2.1.3 The antenna masts shall be constructed from aluminum or duraluminum. Seamless telescoping tubing may be used. Arrangements shall be provided for firmly locking the mast sections into place during operation.

3.2.1.4 The bases of the masts shall be arranged to mount detachable antenna coupling units.

3.2.1.5 The tops of the masts shall be capped to prevent the entrance of water.

3.2.2 Tripod supports. - The supporting tripods shall be fabricated from aluminum or duraluminum and shall be removable from the masts.

3.2.2.1 A turnbuckle assembly shall be provided on each tripod to permit adjusting the monopole vertical alignment and height of base from the ground, so that the bases of the monopoles of a given array can be adjusted to lie in the same horizontal plane $\pm$0.5 inch.

3.2.2.2 A ground anchor shall be provided for each tripod to function as an effective hold-down system.

3.2.2.3 Each tripod leg shall be anchored to the ground.

3.2.2.4 Base plates shall be provided for each tripod leg to prevent the leg sinking into soft ground.

3.2.2.5 The tripod legs shall be insulated from the antenna masts.

3.2.3 Counterpoise screens. - Individual counterpoise screens shall be provided for each monopole and shall consist of flexible square screens of the following approximate dimensions:

Type	Length of side of square
I	9 feet
II	6.5 feet

3.2.3.1 In the interest of transportability, each counterpoise screen shall be composed of two mat sections. Grounding straps shall be provided to electrically connect the two mat sections of each counterpoise together.

3.2.3.2 Arrangements for grounding the coupling networks to the counterpoise mats shall be provided.

3.2.3.3 Heavy gauge copper mesh shall be used for the counterpoise mats.

3.2.4 Mast spacings. - The masts shall have diagonal spacings as follows:

Type I - 36 feet.
Type II - 16 feet.

3.2.5 Antenna coupling units. - Antenna coupling units shall be provided at the base of each mast.

3.2.6 Cabling. - The antenna arrays shall use the extended-U cabling connection as shown in figure 1, with cables laid on the ground. Distances between arrays, location of the operating shelter, and cable runs shall be similar to those outlined in figure 1.

3.2.6.1 RG-24/U cable shall be used.

3.2.6.2 A cable harness shall be provided for each array to conform to the layout illustrated in figure 1. Cables shall be cut to the proper lengths and suitable connectors attached. The electrical lengths of corresponding cables shall be identical to within 15 electrical degrees at 30.0 mc. Arrangements shall be provided to preserve the waterproof integrity of the cables during transportation and storage.

3.2.7 Antenna orientation equipment. - A suitable compass and sighting arrangement, plumb-bobs, and steel chains shall be provided for laying out the antenna site.

3.2.8 Transit cases. - Cases shall be provided for transporting the DAQ receiving and indicating equipment, the antenna arrays, cabling, etc.

3.3 Electrical requirements. - The antenna arrays are to function utilizing Model DAQ receiving and indicating equipment and shall fulfill the following:

3.3.1 Frequency range. - The low frequency (type I) arrays shall operate over the frequency range of 1.5 to 7.5 mc. The high frequency (type II) arrays shall operate over the frequency range of 7.5 to 30.0 mc.

3.3.2 Antenna coupling networks. - Antenna coupling networks designed to minimize the effects of cross-modulation shall be provided to couple the antennas to the transmission lines.

3.3.2.1 Gain. - The coupling gain of the antenna coupling networks is defined as the ratio of the voltage delivered to the transmission line to the voltage induced in the antenna.

$$G_C = \frac{\text{Voltage delivered}}{\text{Antenna voltage}}$$

3.3.2.1.1 The gain of the networks shall not be less than -10 db.

3.3.2.1.2 The gain variation among the coupling networks shall not be greater than 0.5 db at any specific frequency.

3.3.3 Depth of null. - The ratio of the maximum response to the minimum response of the antenna arrays shall be at least 30 db.

3.3.4 Accuracy. - The arrays shall have an uncalibratable error of less than ±3 degrees over the frequency range of 1.5 to 22.0 mc. This error may be greater over the range of 22.0 to 30.0 mc.

3.3.5 Sense action. - The sense indication shall be true and positive when receiving any single ray vertically polarized signal.

3.3.6 Lightning. - Suitable means shall be provided to adequately protect the equipment from lightning damage.

3.4 Mechanical requirements. - The equipment supplied shall meet the applicable mechanical requirements of Specification 16E4 except as otherwise specified herein. The construction of the antenna arrays shall be such as to enable continuous operation under severe climatic conditions.

3.4.1 Wind. - The design and construction of the arrays shall be such as to permit continuous operation in winds up to 60 miles per hour and in gusts up to 80 miles per hour.

3.4.2 External finish. - External finish of the equipment shall be as specified in Specification 16E4. With the exception of the counterpoise mats, the finish coats shall be olive-drab paint conforming to Specification TT-P-81.

3.4.3 Waterproofing. - The design of the antenna arrays shall consider the possible periodic inundation of the installation site. All fittings, cables, junction boxes, and the like shall be watertight (3-foot), in accordance with Specification MIL-E-2036.

3.4.4 Corrosion. - The construction of the equipment shall give maximum protection against corrosion and galvanic action when the arrays are continuously exposed to a highly saline atmosphere.

3.4.5 Weight. - The design and construction of the arrays shall be such as to keep the weight of the equipment a minimum, consistent with meeting the other requirements of this specification.

3.4.6 Life. - The mechanical design of the equipment and the methods of assembly shall be such that erection and dismantling the equipment shall not unduly prejudice the equipment life by causing excessive wear.

3.4.7 Standard parts. - Where possible, the components of the arrays shall be in accordance with Specification 16E7.

3.4.8 Standard tools. - Where possible, the tools required for assembling the arrays shall be of standard types. In the event special tools are required, they shall be furnished with each array by the contractor.

3.4.9 Workmanship. - Workmanship shall be as specified in Specification 16E4 and shall be of the highest quality.

3.4.10 Transit cases. - The transit cases, as described in Specification MIL-T-945, shall be designed and constructed for maximum transportability, consistent with ease of packaging and setting up the equipment, and protection of the enclosed equipment.

3.4.10.1 Separate packaging shall be provided for each array. It shall not be necessary to unpackage any portion of a low frequency (type I) array to set up a high frequency (type II) array, and vice-versa.

3.4.10.2 The transit cases shall have dimensions no greater than the following:

Cases for array monopoles	Other cases
Length - 15 feet.	Length - 39 inches.
Width - 12 inches.	Width - 22 inches.
Height - 12 inches.	Height - 17 inches.

3.4.10.3 The weight of each individual transit case, including enclosed equipment packed for transportation, shall not exceed 200 pounds.

3.4.10.4 The transit cases shall protect the enclosed equipment from injury due to adverse weather conditions.

3.4.11 Ease of assembly. - The design and construction of the arrays shall permit rapid unpackaging and assembly under adverse climatic conditions with a minimum of manpower.

3.4.11.1 Minimum manpower shall be interpreted as 5 man-hours per array with two men familiar with the equipment performing the assembly.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 General. - Acceptability tests shall be conducted in accordance with Specification 16E4, except as otherwise specified herein.

4.1.1 Shock, vibration, and inclination; salt spray tests; and accelerated life tests are not required.

4.1.2 Inspection procedures. - The general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

4.2 Acceptability tests. - Acceptability tests shall be made at the place of manufacture under Government supervision, on the first production model. The tests outlined in 4.3, 4.4, and 4.5 are the minimum necessary to determine the effectiveness of construction in the attainment of the desired characteristics. The Bureau of Ships reserves the right to add to this listing and to delete or modify any test if the need for such addition, deletion, or modification is indicated.

4.3 Visual inspection. - A complete visual inspection shall be made of all equipment supplied to evaluate compliance with this specification.

4.4 Electrical tests. - The following electrical tests shall be made:

4.4.1 Antenna coupling networks. - The coupling gain of each network shall be measured to evaluate compliance with the requirements of 3.3.2.1.1 and 3.3.2.1.2.

4.4.1.1 Procedure for measurement. - Connect the antenna coupling network to a standard dummy antenna as defined in the publication "Standard Direction Finder Measurements" (see 6.1). Connect a low impedance signal generator (1 ohm or less) to the input terminals of the dummy antenna. Connect a 140-ohm balanced-input receiver to the output terminals of the network. Establish reference output from the receiver. Record signal general reading, input (1). Disconnect the coupling network. Apply the signal generator output

through a suitable matching network to the receiver. Obtain reference output from the receiver by adjustment of the signal generator. Compensate this signal generator reading for the loss in the matching network to obtain input (2). Calculate the ratio of input (2) to input (1). Express the result in decibels. Repeat this complete procedure at six uniformly spaced intervals over the frequency band of the coupling network under test.

4.4.2 Collector response pattern. - Determine the collector response pattern, following the procedure outlined in the publication "Standard Direction Finder Measurements."

4.4.3 Sense performance. - Data shall be furnished indicating the sense performance as determined by observations of available transmissions chosen at random throughout the frequency range of the equipment.

4.5 Mechanical tests. - Mechanical tests shall be conducted in accordance with the applicable requirements of Specification 16E4 except as otherwise specified herein.

4.5.1 Transit cases. - Tests shall be performed to evaluate fulfillment of the requirements of 3.4.10, 3.4.10.1, 3.4.10.2, 3.4.10.3, and 3.4.10.4.

4.5.2 Assembly. - An assembly test shall be performed to determine the time required for two men familiar with the equipment to unpack and set up one array, laying out the site, placing, and connecting the required cables. The equipment shall operate in a satisfactory manner after such assembly.

5. PREPARATION FOR DELIVERY

5.1 Equipment. - Equipment shall be prepared for delivery in accordance with Specification JAN-P-658. Equipment shall be given the service type of packing for domestic shipment or shall be packed for overseas shipment, as specified in the contract or order.

5.2 Spare parts kits. - Spare parts kits shall be prepared for delivery in accordance with the requirements for on board spare parts of Specification JAN-P-658.

5.3 Special tools. - For shipment purposes only, all special tools which normally will be included in the equipment itself in suitable holders, shall be packed in one of the spare parts boxes containing maintenance parts, together with instructions concerning their proper location.

6. NOTES

6.1 Copies of Standard Direction Finder Measurements, Instruction Books for Model DAQ High Frequency Radio Direction Finder System, and Instruction Book for Radio Set SCR-502 may be obtained upon application to the Bureau of Ships, Code 838, Navy Department, Washington 25, D. C.

6.2 Copies of this specification may be obtained only upon application to the Bureau of Ships, Navy Department, Washington 25, D. C. When requesting, state title and number of the specification and the purpose for which required.

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

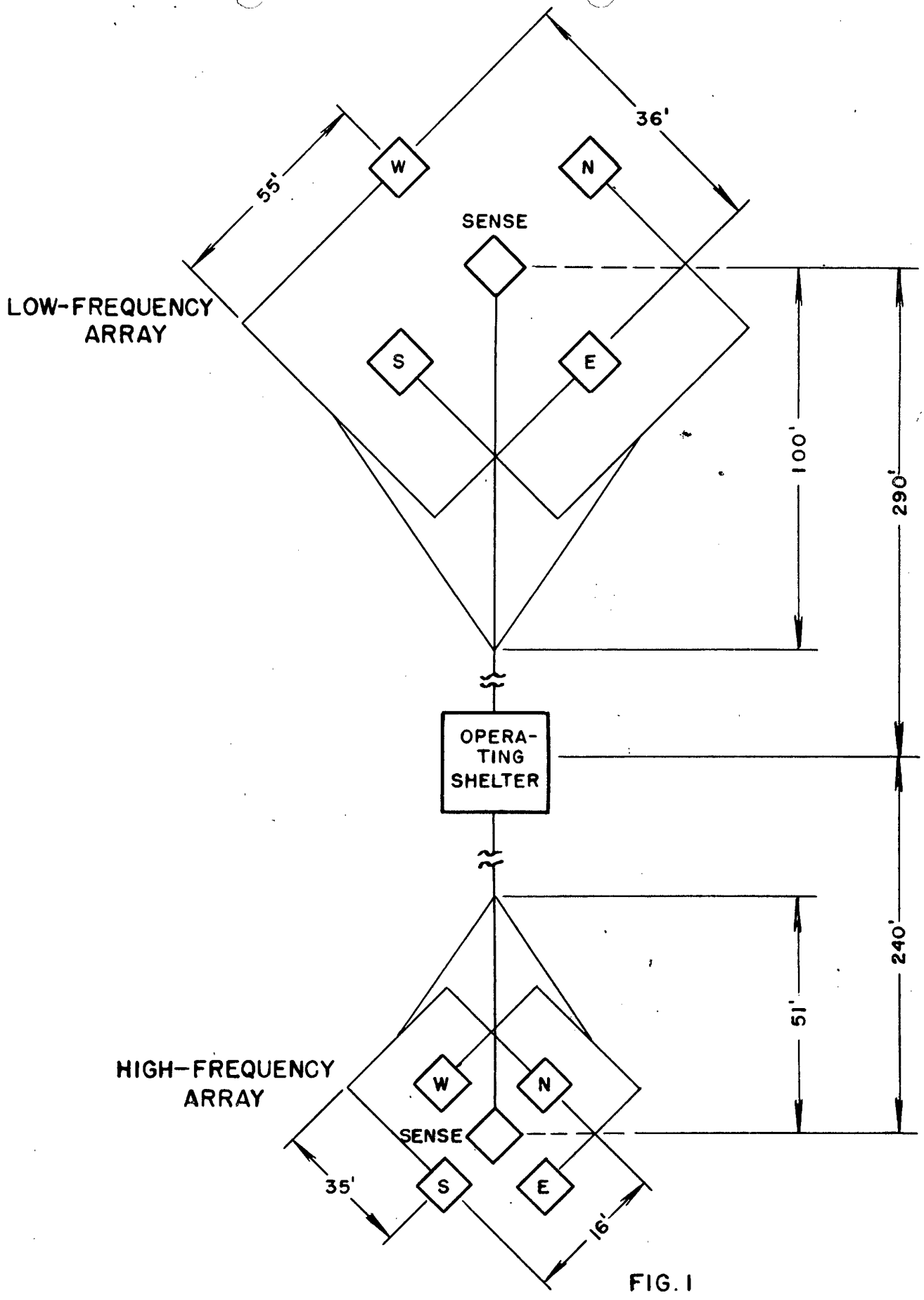

FIG. 1